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Substance abuse and violence A review of the literature

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Abstract

Most alcohol and drug use occurs among persons who are not violent. However, alcohol and, to a lesser extent, illicit drugs are present in both offenders and victims in many violent events. The links between psychoactive substances and violence involve broad social and economic forces, the settings in which people obtain and consume the substance, and the biological processes that underlie all human behavior. In the case of alcohol, evidence from laboratory and empirical studies support the possibility of a causal role in violent behavior. Similarly, the psychopharmacodynamics of stimulants, such as amphetamines and cocaine, also suggest that these substances could play a contributing role in violent behavior. On the other hand, most real-world studies indicate that this relationship is exceedingly complex and moderated by a host of factors in the individual and the environment. In addition to psychopharmacological effects, substance use may lead to violence through social processes such as drug distribution systems (systemic violence) and violence used to obtain drugs or money for drugs (economic compulsive violence).

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1. Introduction

The term “substance” can refer to a drug of abuse, a medication, or a toxin (American Psychiatric Association [APA], 1994). Various classes of substances include: alcohol,

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amphetamines, cannabis, cocaine, hallucinogens, inhalants, nicotine, opioids, phencyclidine (PCP) and sedatives, hypnotics, or anxiolytics (APA, 1994). This paper reviews the findings from diverse disciplines on the complex relationship between substance abuse and violence.

2. Relationship of substance use to violence

Most alcohol and drug use occurs among persons who are not violent (Fagan, 1990). However, alcohol and, to a lesser extent, illicit drugs are present in both offenders and victims in many violent events. Although substance abuse, particularly alcohol, has been associated with violent behavior for many decades, research has rarely documented causal linkages due to the multiple variables that are involved in assessing etiology (Allen, Moeller, Rhoades, & Cherek, 1997; Johnson & Belfer, 1995; Paglia & Room, 1998).

The connection between substance use and violent behavior is complex and is suggestive rather than conclusive (Fagan, 1993a; Johnson & Belfer, 1995; Roth, 1994). In addition, there is insufficient research towards the specific causal role that substances play in the perpetration of violence (Fagan, 1993b; Roizen, 1993; Roth, 1994). However, the increased prevalence for violence associated with substance abuse underscores the importance of examining the network of interacting processes and feedback loops that associate substance abuse and violence (Fagan, 1993a; Reiss & Roth, 1993).

The use of substances occurs in environmental, social, situational, and cultural contexts that influence the potential for violent outcomes (Fagan, 1993b). The presence of alcohol or drugs in violent events does not necessarily imply that these substances affected the behavior of either the perpetrator or victim (as cited in Fagan, 1993a). Further, different substances affect individuals differently, based on their physiology, psychology, history, gender, and other personal and cultural factors (Collins, 1993; Reiss & Roth, 1993).

3. Psychosocial factors that play a role in violence

Several psychosocial factors have been found to play a role in violence (Chermack & Giancola, 1997). These factors include influences on the individual's behavior patterns, which begin developing in early childhood and continue to evolve through adulthood. Patterns of aggressive behavior and substance abuse often become intertwined early in development. These developmental factors have been identified as contributors to violence. These factors include: an aversive environment, harsh discipline, family aggression, lack of parental supervision, and exposure to violence and substance abuse (Chermack & Giancola, 1997).

Developmental factors can also be predictive of adult violence and substance abuse. For example, early childhood aggression is a predictor of later heavy drinking, and the combination is associated with above-average risk of adult violent behavior (Roth, 1994). This risk is especially enhanced among those who also abuse other psychoactive drugs (Roth,

1994). This is commonly seen in individuals with comorbid antisocial personality disorder and substance abuse where the disturbance of conduct and aggression began in childhood. Aside from the role of psychopathology, studies on temperament have shown that impulsive–aggressive personality traits in childhood and adolescence predict an early onset of substance abuse (as cited in Cloninger, 1999). An impulsive–aggressive temperament appears to predispose to risk-taking behavior. However, youth violence in general tends to be impulsive and linked to other risk-taking behaviors (Mann et al., 1998).

Individual histories of aggressive and violent behavior are a critical determinant of whether or not alcohol and psychoactive drug use increases those behaviors (Reiss & Roth, 1993). It has been theorized that the best predictor of future violence is a past history of violence. Accordingly, abnormal deviant behavior in childhood has been found to be a fairly reliable predictor of aggressive behavior in adulthood (Friedman, Kramer, & Kreisher, 1999). Many people behave aggressively when under the influence of drugs. However, they are more likely to behave that way if they also exhibit such behavior when not on drugs (Warshaw & Messite, 1996).

Finally, gender may also be of fundamental importance in modifying the relationship between alcohol use and violent behavior (Reiss & Roth, 1993). National surveys report that male drinking patterns are more likely, than those of females, to incorporate binge drinking with aggressive behavior, and that violent behavior while under the influence of alcohol is very rare among females (as cited in Fagan, 1990; Pihl & Peterson, 1993b). In contrast to alcohol, drug use has been found to be associated with violent behavior for both women and men (Friedman, 1998).

4. Neurobiology of violence

Biological factors play a role in the etiology of violence; however, similar to substance use, biological factors have not been shown to cause violence. Biological factors associated with aggression include alterations in the levels of monoamine neurotransmitters (i.e., serotonin, dopamine, and norepinephrine). The most frequently cited and often oversimplified biological correlate of violence is a low level of serotonin. In general, the serotonin system plays a role in feeding psychological disorders and aggression (Mann, 1995). Abnormal serotonergic activity in humans may be more predictive of impulsive psychiatric disturbances, depression, and or anxiety than of aggression dysfunction. The influence of psychiatric disturbance in combination with substance abuse in the etiology of violence merits further study. It is notable that acute alcohol administration causes release of serotonin. However, a baseline decreased serotonergic activity has been identified in a subset of individuals with alcoholism (Higley & Linnoila, 1997), which is also associated with increased aggression and violence. Although studies are inconclusive, the association between alcohol and violence may, in fact, be mediated by chemical messengers such as serotonin (Coccaro & Kavoussi, 1996).

Other monoamine neurotransmitters that are thought to have a role in aggression are dopamine and norepinephrine (Coccaro & Kavoussi, 1996). Both dopamine and norepi-

nephrine are involved in behavioral regulation and therefore modulate human aggressive behavior (Berman & Coccaro, 1998; Fishbein, Lozovsky, & Jaffe, 1989). There is extensive literature concerning the role of dopamine in multiple behavioral processes and reward mechanisms, and for the role of norepinephrine in attention, arousal, and vigilance.

Monoamine neurotransmitters also play key roles in the neurobiology of abused drugs. Drugs, such as amphetamines release norepinephrine, dopamine, and serotonin, whereas cocaine acts as monoamine reuptake inhibitor, particularly of dopamine and norepinephrine. It is the enhancement of transmission in the dopaminergic and noradrenergic systems that is thought to increase aggression. Cocaine, alcohol, and amphetamine are believed to initially cause excess transmitter followed by a state of depletion. This depletion state is presumed to be associated with changes in mood that may predispose to aggression.

The sex hormone, testosterone, may also play a role in mediating aggressive behavior. In a study conducted by Banks and Dabbs (1996), testosterone levels were compared in 36 “US college students” and 29 “delinquent participants.” Results from this study found higher concentrations of testosterone in violent offenders (Banks & Dabbs, 1996). In a similar study performed by Brooks and Reddon (1996), testosterone samples were compared between “violent” ($n=75$) and “nonviolent” ($n=102$) offenders. Results showed that the “violent” group had significantly higher levels of testosterone (Brooks & Reddon, 1996). Additional research has shown that low acute doses of alcohol temporarily increase, while high doses temporarily decrease aggressive behavior in many animal species, including humans (Reiss & Roth, 1993). These low, acute doses of alcohol were found to increase aggressive behavior in individuals who already had high blood testosterone, presumably as a result of testosterone action in the brain (Reiss & Roth, 1993). The fact that males are more likely to behave violently after consuming alcohol, suggests the possibility of an endocrinological interaction (Reiss & Roth, 1993). Further studies are needed to determine the extent of this endocrinological interaction.

Other biological predictors for increased risk of aggression include: prior brain injury, temporal lobe dysfunction, history of pathologic intoxication, and encephalopathy. Abnormal electrical activity has been demonstrated in cases of aggression and is thought to involve the temporal lobes, amygdala, and limbic structures (Fenwick, 1989). Patients with temporal lobe epilepsy demonstrate abnormal electrical activity that is uncommonly associated with postictal acts of aggression (Fenwick, 1989). Further studies have shown that violent offenders in a maximum-security hospital were more likely to have temporal lobe electrical and structural abnormalities (Wong, Lumsden, Fenton, & Fenwick, 1994). It has been postulated that alcohol might mediate violent behavior through effects on electrical activity in the brain (Reiss & Roth, 1993) most notably in cases of pathological intoxication. In addition, current research in the role of pharmacological kindling has led to the hypothesis that cocaine use may sensitize the release of limbic–hypothalamic mechanisms for aggressive behavior (Davis, 1996). Exposure to solvents both in recreational and occupational settings has been shown to cause a toxic encephalopathy (Sharp, Beauvais, & Spence, 1992). Although solvent use is not reviewed in this manuscript, solvent exposure is notable because acts of violence and aggression have been seen independent of the voluntary decision to use.

5. Withdrawal and violence

Withdrawal produces a set of characteristic physical and psychiatric effects, and it is the pursuit to alleviate these effects with drugs or alcohol that can develop into aggressive behavior. Violence associated with daily heroin use typically occurs in desperate drug-seeking individuals who fear the symptoms of opioid withdrawal. Alcohol- and drug-induced psychotic disorders are conditions characterized by prominent delusions or hallucinations that develop during or following drug use. Episodes of substance-induced delirium and psychosis can impair judgment or cognition, leading to impulsive or destructive behaviors.

6. Types of violence

There are three basic ways in which substance abuse is related to violence. First, violence can be perpetrated under the influence of substances. Goldstein (1985) labels this type of violence “psychopharmacological violence.” Psychopharmacological violence occurs as a result of the short- or long-term use of certain drugs that produce excitability, irritability, paranoia, or violent behavior. Psychopharmacological violence can also occur when the use of substances results in changes or impairments in cognitive functions, intensified emotional states, or disruptions of hormonal or physiological functions that motivate or restrain violence. This form of violence may involve substance use by either the perpetrator or victim. For example, substance use may contribute to a person behaving violently, or it may alter a person’s behavior in such a manner as to bring about that person’s violent victimization (Goldstein, 1995). The most relevant substances in this regard are alcohol, stimulants (cocaine and amphetamines), PCP, and barbiturates (Fagan, 1993a; Goldstein, 1985). There is little evidence supporting the relationship between psychopharmacological violence and the use of marijuana or opioids (Goldstein, 1985). Several drugs, such as heroin or tranquilizers, may actually ameliorate violent tendencies (Goldstein, 1985).

The second type of violence related to substance use has often been labeled “systemic violence” (Goldstein, 1985). Systemic violence refers to the aggressive patterns of interaction within the system of drug distribution and use (Goldstein, 1985). Examples of systemic violence include: murders over drug turf and violence by drug distributors in the course of territorial disputes, retribution for selling “bad” drugs, the use of threats and violence to enforce rules within a drug-dealing organization, fighting among users over drugs or drug paraphernalia, battles with police, and elimination of informers (Goldstein, 1985; Roth, 1994). A substantial number of users, of any drug, become involved in drug distribution as their drug-using careers progress and, hence, increase their risk of becoming a victim or perpetrator of systemic violence (Goldstein, 1985).

The third type of violence is called “economic compulsive violence” and is related to the acquisition of drugs (Goldstein, 1985). Economic compulsive violence is intentional violence that results from drug users engaging in an economically oriented violent crime in order to generate money to support their addiction. Violence generally results from some factor in the

social context in which the economic crime is committed (Goldstein, 1985). For example, violence may be related to the perpetrator's own nervousness, the victim's reaction, or weaponry carried by either the perpetrator or victim (Goldstein, 1985). Economically based violence applies to all substances for which there is no legal market (Lavine, 1997). The two substances most commonly linked to economic compulsive violence, are heroin and cocaine, because of their expense.

Overlap between the three types of violence often occurs. For example, a heroin user preparing to commit a robbery may ingest some alcohol or stimulants to give himself courage (Goldstein, 1985). This event contains elements of both economic compulsive and psychopharmacological violence. Various studies have found evidence of all three types of drug-related violence. For example, a study in New York City during the late 1980s classified most of the drug-related murders as systemic violence (74%), with only 7% classified as economic compulsive, and 3% as pharmacological (Goldstein, Brownstein, & Belluci, 1989).

7. Substance use in the occurrence of violent events

Violence can occur in various phases of drug use including acute intoxication, drug-seeking behavior associated with withdrawal, and episodes of drug-induced psychosis and paranoia associated most often with stimulant use. Acute intoxication, most notably with alcohol, causes disinhibited behavior and leads to aggression in persons prone to violent behavior. In addition, substance-induced aggression during intoxication can occur in dependent or nondependent users.

A number of studies show that the use of substances is involved in many violent incidents. For example, in a community sample, Swanson, Holzer, Ganju, and Jono (1990) found that substance abuse was the most prevalent diagnosis among those who were violent. The same study found that the prevalence of violence among persons who meet criteria for a diagnosis of alcoholism was 12 times that of persons who did not have a diagnosis, and the prevalence of violence among persons who meet criteria for being diagnosed as abusing drugs was 16 times that of persons who receive no diagnosis (Swanson et al., 1990).

Other studies have found that a substantial proportion of inmates incarcerated for violent crimes are substance-involved. For example, among violent offenders, the majority (73% in state prison, and 65% in both federal prison and in jail) have regularly used drugs or have a history of substance abuse. Many committed their crimes to get money for drugs or were under the influence of drugs at the time of their crime (National Center on Addiction and Substance Abuse at Columbia University, 1998). In addition, another study found that 60% of arrestees for violent offenses tested positive for at least one illegal drug (National Institute of Justice, 1996).

In the specific case of alcohol, researchers have consistently noted that alcohol use by the perpetrator or victim immediately preceded many violent events (Greenberg, 1981; Pihl & Peterson, 1993b; Roth, 1994). In addition, other studies have found drinking to precede at least half of all violent events (Pernanen, 1991; Roth, 1994). In fact, drinking more than

five drinks per occasion increases the likelihood that the drinker will be involved in violence, either as perpetrator or a victim (Collins & Schlenger, 1988). More than any other group, young adults are likely to have been drinking prior to being either a perpetrator or victim of fatal or nonfatal violence (Pernanen, 1976; Welte & Abel, 1989). Alcohol use by both attacker and victim is common in incidents of rape, assault, robbery with injury, and family violence (Fagan, 1993a,b; Pihl & Peterson, 1993b; Roizen, 1993). In addition, Roizen (1993) reports that in nearly 40 studies of violent offenders, and an equal number of studies of victims of violence, alcohol involvement was found in about 50% of the cases.

Alcohol is more closely linked to murder, rape, and assault than any other substance (Martin, 1993; Parker & Rebhun, 1995; Pernanen, 1991; Pihl & Peterson, 1993b). In fact, alcohol is implicated in most homicides arising from disputes or arguments (Bradford, Greenberg, & Motayne, 1992; Pernanen, 1991). More widely available and abused than illicit drugs, alcohol has been found to be a key factor in the rising homicide rates in the United States between 1960 and 1980 (Parker & Rebhun, 1995).

Alcohol has also been found to be a contributing factor in incest, child molestation, spousal abuse, and other family violence (Leonard, 1993; Miczek, Weerts, & DeBold, 1993; Widom, 1993). The percentage of batterers who are under the influence of alcohol when they assault their partners ranges from 48% to 87% (Gorney, 1989). In addition, it is estimated that between one-third and three-quarters of sexual assaults involve alcohol consumption by the perpetrator, the victim, or both (Collins & Messerschmidt, 1993).

Despite these statistics, only a few studies demonstrate the relationship between chronic drinking and the potential for violent behavior (Reiss & Roth, 1993). However, the existing studies find that problem/chronic drinkers or alcoholics are more likely than others to have histories of violence, including more previous arrests for a violent crime (Collins, 1986; Reiss & Roth, 1993; Roth, 1994; Schuckit & Russell, 1984). Conversely, there has been a high rate of alcoholism found among violent offenders (Greenberg, 1981; Reiss & Roth, 1993). This evidence suggests the need for further studies and targeted treatment interventions.

8. Licit drugs and violence

Almost all of the common drugs of abuse may lead to violent behavior, though often by very different mechanisms (Lavine, 1997). In addition, biological links between psychoactive substance use and violence differ by type of drug, amount, and pattern of use. The following sections discuss the various licit and illicit drugs and their relationships to violence. These relationships are summarized in Table 1.

8.1. Alcohol

Alcohol is the substance most frequently cited as being related to aggressive and violent behavior (Bachman, 1994; Bradford et al., 1992; Bureau of Justice Statistics, 1991; De la

Table 1
The relationships of licit and illicit drugs to violence

Substance	Type of violence			
	Pharmacological	Systemic	Economic compulsive	None
Alcohol	×			
Nicotine				×
Benzodiazepines/sedatives–hypnotics	×			
Marijuana	×			×
Amphetamines/methamphetamines	×	×		
Cocaine	×	×	×	
Opioids			×	
PCP	×			
Hallucinogens				×

Rosa, Lambert, & Gropper, 1990; Martin, 1993; Parker & Rebhun, 1995; Pernanen, 1991; Pihl & Peterson, 1993b; Potter-Efron & Potter-Efron, 1990; Timrots, 1995; Tonry & Wilson, 1990; Warshaw & Messite, 1996; Zhang, Wiczorek, & Welte, 1997). It is also the substance most likely to be involved in pharmacological violence (Fagan, 1990; Friedman, 1998), due to its effects on behavior.

The most common and direct link for alcohol to aggression is through alcohol intoxication (Lavine, 1997). Research indicates that the most commonly accepted mechanism for alcohol-induced aggression is through the disinhibition of fear via anxiolytic action (Lavine, 1997). For example, alcohol can affect cognitive function in such a way as to decrease the capacity to plan actions in response to threatening situations. Alcohol may also increase the perception of pain as a cause of greater defensive aggression. In addition, there is also the theory that the link between alcohol and aggression is a matter of the expectancy of the intoxicated individual that such behavior is likely to occur.

Alcohol may also serve as a triggering mechanism to instigate aggressive acts for those who already have violent propensity and who find themselves in “aggressible” situations (Feldman, 1977). For example, several studies have found that people who have a dispositional inclination to be aggressive are more likely to exhibit high levels of aggression when they consume alcohol in comparison to those who do not drink (Bailey & Taylor, 1991; George, Derman, & Nochajski, 1989; Pihl, Smith, & Farrell, 1984; Zhang et al., 1997). In addition, alcohol abusers who abuse other psychoactive substances, or who are diagnosed with antisocial personality disorder, are at especially high risk of chronic violent behavior (Roth, 1994).

Chronic alcoholism can lead to personality changes in which the tendency to blame others becomes more prominent. These changes, in addition to the array of interpersonal difficulties that are associated with chronic drinking, often lead to aggressive verbal conflict and sometimes to physical conflict (Lavine, 1997). Chronic alcohol use lead to episodes of alcohol withdrawal, and this may also be a cause for aggressive behavior. Alcohol withdrawal can cause a person to get quite irritable or agitated.

Although much research has demonstrated the relationship between drinking and violent behavior, the connection remains complex (Fagan, 1993a). We still know little about the specific causal role that alcohol plays in violence (Fagan, 1993b; Paglia & Room, 1998; Roizen, 1993). We know that alcohol operates in environmental, social, situational, and cultural contexts that influence the potential for violent outcomes in drinking situations (Fagan, 1993b). Further, we also know that alcohol affects individuals differently, based on their physiology, psychology, history, gender, and other personal and cultural factors (Collins, 1993; Reiss & Roth, 1993).

However, if alcohol caused violence only by making individuals behave more aggressively, violence would be equally common in all places where drinking occurs. In fact, most drinking places are rarely scenes of violence. There are group drinking situations or settings where violence is expected and socially accepted, such as “fighting bars” and “sporting events” (Roth, 1994). It is not precisely known just what characteristics of a drinking place make it a hazard for violence, but there is supporting evidence for several possible explanations. People who drink in “fighting bars” may behave violently in order to fit in or to advance socially. People who experience anger or frustration may seek out such settings, because they believe that drinking in these types of establishments means social permission to engage in violent behavior (Roth, 1994).

Researchers have found it difficult to cut through these complexities to specify the particular effects of alcohol on violence. Nevertheless, the association between alcohol and violence is well documented. Some possible explanations for this connection are:

- Being drunk may provide a justification — or “alibi” — for behaviors normally proscribed by society (McCord, 1993).
- Alcohol may contribute to the misreading of signals by both the offender and the victim (Pihl & Peterson, 1993b; as cited in Roizen, 1993).
- By reducing inhibitions, alcohol may impair attention to internal behavioral cues and the consideration of consequences (Pihl & Peterson, 1993b; as cited in Roizen, 1993).
- Alcohol may decrease frontal lobe functioning, affecting ability to handle new or threatening situations and to develop alternative strategies to solve problems (Pihl & Peterson, 1993a,b).
- Alcohol may affect neurochemical systems that mediate aggressive behavior (Miczek et al., 1993).

Other factors, such as behavior patterns when people are not drinking, the setting in which people drink, and local drinking customs, also influence the strength of the relationship between alcohol and violence (Roth, 1994). Miczek et al. (1993) noted that “whether or not alcohol in a range of doses ... causes a certain individual to act aggressively more frequently or even to engage in ‘out of character’ violent behavior depends on a host of interacting pharmacological, endocrinological, neurobiologic, genetic, situational, environmental, social, and cultural determinants.” Collectively, this evidence suggests that the interaction between alcohol and violence is complex and dependent on many different factors.

8.2. *Nicotine*

Nicotine use has not been found to be associated with violence. Unlike the other addictions, heavy use of tobacco has not been widely recognized as producing significant psychological disturbance, other than craving and difficulty in stopping (Ockene, Kristeller, & Donnelly, 1999). Smoking, like other addictive behaviors, is maintained because it provides a way of minimizing negative affects (i.e., distress; anger, fear, shame, contempt) and evokes the positive affects of excitement, enjoyment, and surprise (Ockene et al., 1999). For reasons that are likely related to the psychoactive effects of nicotine, individuals with current or past histories of significant psychiatric problems, including depression and schizophrenia, are much more likely to be smokers (Ockene et al., 1999). For example, about 80% of substance abusers in treatment are smokers (as cited in Ockene et al., 1999).

Nicotine withdrawal produces symptoms of mood disturbance and mild irritability. Given the high rate of substance use and psychiatric disorders associated with smoking, any disproportionate violence that may occur among smokers is likely the result of the polysubstance use or comorbid psychiatric disorders.

8.3. *Benzodiazepines and other sedative-hypnotics*

Sedative-hypnotics may be associated with pharmacological violence due to the irritability and anxiety that often results from intoxication and withdrawal (Fagan, 1993b; Pihl & Peterson, 1993b). Sedative-hypnotics, such as benzodiazepines, are normally thought of as tranquilizers, commonly prescribed to ameliorate symptoms of insomnia and anxiety. Although many users take them for their sedating effects, people who use them often become disinhibited.

One class of sedative-hypnotics commonly used are benzodiazepines. Benzodiazepines are rarely primary drugs of abuse (Smith & Wesson, 1999), commonly taken with other substances. Examples of situations where benzodiazepines are used with other substances include: benzodiazepine use while receiving methadone maintenance for heroin addiction (as cited in Smith & Wesson, 1999) to ameliorate the adverse effects caused by cocaine or methamphetamine, to ameliorate the symptoms of withdrawal caused by heroin or alcohol, to enhance the effects of methadone, or to produce intoxication when other drugs are unavailable (Smith & Wesson, 1999). In addition, benzodiazepine use has also been associated with alcohol and prescription drug users who use benzodiazepines for treatment of chronic anxiety or insomnia (Smith & Wesson, 1999).

Conversely, short-acting sedative-hypnotics, such as pentobarbital or secobarbital, are primary drugs of abuse. The effects of sedative intoxication are similar to alcohol intoxication, producing a state of disinhibition in which mood is elevated; self-criticism, anxiety, and guilt are reduced; and energy and self-confidence are increased (Smith & Wesson, 1999). During sedative intoxication, the user's mood is often labile and may shift rapidly between euphoria and dysphoria. Sedative intoxication may also produce

irritability, anxiety, and anxiousness (Smith & Wesson, 1999). Similar to alcohol intoxication, intoxication from sedatives may lead to poor judgment. In addition, those suffering from sedative withdrawal may experience symptoms of anxiety, irritability, tremors, nightmares, and insomnia. In severe cases, sedative withdrawal may produce visual and auditory hallucinations.

9. Illicit drug use and violence

Abuse of illicit drugs is also connected to crimes of violence, although there are relatively few sources of data on patterns of illicit drug use and violence (Pihl & Peterson, 1993b; Reiss & Roth, 1993). Criminals who use illegal drugs commit robberies and assaults more frequently than do nonuser criminals, and they commit them especially frequently during periods of heavy drug use (Roth, 1994). In addition, there is evidence that chronic use of illicit drugs (opioids, amphetamines, marijuana, or PCP) can eventually alter the nervous system in ways that disrupt social communications; an effect that may increase one's involvement in altercations that escalate to violence (Reiss & Roth, 1993).

Most studies that evaluate the relationship between illicit drugs and violence group all illicit drugs together, thus failing to make a theoretical or empirical distinction between the association of a specific illicit drug to violence (Parker & Auerhahn, 1998). Although this association is difficult to determine, violence within this context primarily occurs through drug marketing, disputes among rival distributors, arguments and robberies involving buyers and sellers, property crimes committed to raise drug money and, more speculatively, through social and economic interactions between the illegal markets and the surrounding communities (Roth, 1994). The following is a description of illicit drugs and their relationship to violence.

9.1. Marijuana

Marijuana is the most widely used illicit drug today and has been used for centuries for its mood-altering effects (Gold & Tullis, 1999; Martin, 1999). Marijuana produces an altered state of consciousness characterized by mild euphoria, relaxation, perceptual alterations including time distortion, enhancement of ordinary sensory experiences, impairment of short-term memory, and impairment of motor skills and reaction time (Gold & Tullis, 1999; as cited in Martin, 1999). In addition, marijuana can cause psychiatric disorders, such as panic attacks, paranoia, anxiety, and even psychoses, in individuals who are predisposed to psychiatric illness (as cited in Gold & Tullis, 1999). Withdrawal from marijuana may also produce concomitant anxiety, irritability, and stress (Gold & Tullis, 1999).

Despite these effects, use of marijuana in moderate doses has been found to temporarily inhibit violent and aggressive behavior in animals and humans (Reiss & Roth, 1993). In general, marijuana use has been found to depress activity. In some cases, however, when

marijuana is taken in high doses or in an extremely potent form, it can have psychoactive effects that are difficult to differentiate from those of hallucinogens such as LSD (Gold & Tullis, 1999). Paranoid ideation and persistent paranoia ranging from suspiciousness to frank delusions may also be associated with use (Gold & Tullis, 1999). However, in general, scientific reviews have concluded that violent behavior is either decreased or unaffected by marijuana use (Reiss & Roth, 1993).

9.2. *Amphetamines and methamphetamines*

Considerable investigation has been made into a possible pharmacological link between amphetamines and violence. Amphetamines, particularly methamphetamines, are among the most commonly abused illicit stimulants in the United States (Fischman & Haney, 1999). Among the most important behavioral effects of amphetamines are their mood-altering properties, which can occur with both acute and chronic administration (Fischman & Haney, 1999). A significant consequence of chronic amphetamine abuse is the development of behavioral pathology (as cited in Fischman & Haney, 1999). In its extreme, this pathology can include psychosis characterized by paranoia, impaired reality testing, and hallucinations (as cited in Fischman & Haney, 1999). Amphetamine-induced psychosis has been described as transient, prolonged, or persistent in the psychiatric literature.

Amphetamine use produces a variety of effects ranging from irritability, physical aggression, hyperawareness, hypervigilance, and psychomotor agitation (Kosten & Singha, 1999). Chronic amphetamine intoxication, particularly by the intravenous route, produces a psychotic, paranoid state, including frightening delusions that may result in aggressive acts (Miczek & Tidey, 1989). With increased dosage and duration of administration, amphetamines can produce delirium, which is associated with becoming disoriented, confused, fearful, and anxious (Kosten & Singha, 1999). In addition, during high-dose amphetamine use, individuals can experience stimulant-induced psychosis characterized by delusions, paranoid thinking, and compulsive behavior (Kosten & Singha, 1999).

Psychosis is induced more commonly by amphetamines than by any other stimulants such as cocaine, perhaps because of the longer duration of action produced by amphetamines when compared with the shorter half-life of other stimulants (Kosten & Singha, 1999). For example, smoking methamphetamine produces a “high” that lasts 8–24 h compared to 20–30 min for smoking cocaine (National Institute on Drug Abuse [NIDA], 1998b). In addition, withdrawal from amphetamines can produce symptoms of depression, anxiety, agitation, and intense drug craving (as cited in Kosten & Singha, 1999). The strength of this relationship, however, depends on the user’s prior psychiatric condition (Reiss & Roth, 1993). After large doses of amphetamines, certain individuals may experience violent outbursts, probably because of preexisting psychosis (Roth, 1994) and in some cases, prolonged sleep deprivation.

Amphetamine use has recently been associated with increased crime and violence (Kosten & Singha, 1999), with chronic use more closely related to violent behavior than any other

psychoactive drugs. For example, methamphetamine use has recently been associated with systemic violence in feuds between trafficking gangs. This association may possibly be due to the potential for sudden, intense acts of violence associated with amphetamine action (Miczek & Tidey, 1989). Methamphetamines are a more powerfully addictive stimulant, which have been known to cause agitation, episodes of sudden and violent behavior, intense paranoia, psychotic behavior, and visual and auditory hallucinations (NIDA, 1998a). Therefore, there is substantial evidence in the effects caused by amphetamines to associate amphetamine use with pharmacological and systemic violence.

9.3. Cocaine

Cocaine use has been affiliated with the perpetration of crime and violence (Kosten & Singha, 1999). Intranasal cocaine and crack use have both been found to be associated with pharmacological violence (Fagan, 1993a; Pihl & Peterson, 1993b). Cocaine is one of the most commonly abused illicit stimulants in the United States, with properties similar to amphetamines (Fischman & Haney, 1999) in the context of its mood-altering properties and the development of behavioral pathology (Fischman & Haney, 1999). As with alcohol, aggressive behavior is not limited to addicts, but may also be displayed by casual users. Pathology induced by cocaine use includes: psychosis characterized by paranoia, impaired reality testing, and hallucinations (Fischman & Haney, 1999). Cocaine-related psychosis, however, tends to have a briefer duration than the effects of amphetamines (Mørland, 2000).

Cocaine use can cause irritability and physical aggression, unlike marijuana or heroin, which tend to depress activity. In addition, cocaine intoxication can cause hyperawareness, hypervigilance, and psychomotor agitation and delirium (Kosten & Singha, 1999). In addition, cocaine withdrawal can also produce symptoms of depression, anxiety, agitation, and intense drug craving (as cited in Kosten & Singha, 1999). Ingestion of large doses of cocaine can produce violent outbursts in certain individuals, especially those with preexisting psychosis (Roth, 1994). One survey of Toronto cocaine users found that 17% reported becoming violent or aggressive following cocaine ingestion and one-third of "frequent users" had aggressive feelings associated with cocaine use (Erickson, Adlaf, Murray, & Smart, 1987).

Crack cocaine seems to have a higher association with violence than intranasal cocaine (Pihl & Peterson, 1993b) due to its rapid onset and offset of its effects, which are thought to produce greater levels of irritability and aggressiveness (Kleber, 1995). While intranasal cocaine use may cause pharmacological violence, crack-related violence is also systemic, relating to battles among crack dealers for turf and market share as well as disputes between crack dealers and users, the flaunting of newly acquired wealth, and the need to maintain discipline among dealers (Goldstein et al., 1989; Hamid, 1990). Research finds that crack dealers are often more violent and often commit more nondrug crimes than other types of drug dealers (Fagan & Chin, 1990). This violence is not necessarily caused by crack, and may reflect participation in criminal activity that predated the crack dealers' involvement with crack (Fagan & Chin, 1990).

9.4. *Opioids*

Except for the effects of withdrawal, evidence to support a link between opioid use and violence is virtually nonexistent. Opioid use tends to depress activity, and is not known to produce pharmacological violence. Opioids often produce analgesia, altered mood (often euphoria), decreased anxiety, and respiratory depression (Jaffe & Jaffe, 1999). When opioids are injected intravenously or inhaled, users may experience a brief, intense, usually pleasurable sensation called a “rush” or “thrill” (Jaffe & Jaffe, 1999). This is followed by a longer-lasting period of altered state known as the “high” (Jaffe & Jaffe, 1999).

Opioids temporarily inhibit violent behavior, but withdrawal from opioids tends to exaggerate both aggressive and defensive responses to provocation (Roth, 1994). During withdrawal, which begins about 8–12 h after the last dose (Kleber, 1995), individuals may experience agitation, aggression, hyperalgesia, craving, irritability, dysphoria, anxiety, restlessness, muscle aches and bone pain, cramps, and diarrhea (Jaffe & Jaffe, 1999; H. D. Kleber, personal communication, May 3, 1999). Withdrawal can be so severe and painful that the opioid user may inadvertently become violent in an attempt to get more drugs in order to reduce the symptoms of withdrawal (Goldstein, 1985; H. D. Kleber, personal communication, May 3, 1999; Lavine, 1997). In some cases, addicted individuals may commit crimes to pay for illegal opioids (Lavine, 1997; Senay, 1999).

9.5. *Phencyclidine*

Based on case study research, PCP is widely believed to be associated with violence. According to clinical reports, violent behavior occurs occasionally in persons who are either under the influence of acute doses of PCP or experiencing psychosis brought on by long-term use of the drug (Reiss & Roth, 1993). The frequency of such behavior is unknown. The PCP experience is regarded by users as “pleasant” only half the time and negative or adverse the other half (Schnoll & Weaver, 1999). No experimental studies of PCP and human violence have been conducted, and spontaneous PCP use usually accompanies use of alcohol or other drugs with confounding neurobiological effects (Reiss & Roth, 1993). Therefore, the pharmacological effects of PCP are not yet well understood. There is suggestive evidence, however, that PCP use may be associated with pharmacological violence (Fagan, 1993a; Pihl & Peterson, 1993b).

PCP has limited use as an anesthetic because it was found to cause a high rate of psychotic and violent reactions (McDowell, 1999). PCP is one of the longest-acting drugs of abuse and intoxication may take up to 6 weeks to clear (as cited in Schnoll & Weaver, 1999). PCP use causes a rise in blood pressure, heart rate, and respiratory rate (Schnoll & Weaver, 1999). In addition, it also produces brief dissociative reactions similar to schizophrenic psychoses such as thought distortion and depersonalization (Schnoll & Weaver, 1999). Higher doses of PCP may cause hostility, paranoia, violence and assaultiveness, impulsiveness, agitation, unpredictability, and preoccupation with death (Schnoll & Weaver, 1999). Certain individuals may also experience violent outbursts, possibly because of preexisting psychosis (Roth, 1994).

9.6. *Hallucinogens*

Studies suggest that hallucinogen use itself, particularly LSD, does not trigger violent behavior, but sometimes aggravates the effects of preexisting psychopathology, including violent outbursts (Reiss & Roth, 1993). Hallucinogens are a group of drugs that produce thought, mood, and perceptual disorders. Depending on the dosage, expectation, and environment, they also can induce euphoria and a state similar to a transcendental experience (Ungerleider & Pechnick, 1999). Hallucinogens alter consciousness without delirium, sedation, excessive stimulation, or impairment of intellect or memory (Ungerleider & Pechnick, 1999). They can dilate the pupils, increase the heart rate, and produce slight hypertension and hyperthermia (Ungerleider & Pechnick, 1999).

The emotional responses to hallucinogens can vary markedly. Initial apprehension or mild anxiety is common, but the most common response is euphoria (Ungerleider & Pechnick, 1999). Other common effects include: paranoid grandiosity, persecutory ideation, labile mood (causing a person to shift easily from happiness to depression and back), and chronic personality changes with a shift in attitudes and evidence of magical thinking (Ungerleider & Pechnick, 1999). Less frequently, tension and anxiety culminating in panic have occurred (Ungerleider & Pechnick, 1999).

An atypical schizophrenic-like state may persist, but whether the use of hallucinogens causes or only unmasks a predisposition to this condition is unclear (Ungerleider & Pechnick, 1999). During both the acute and chronic reaction, self-destructive behavior can occur (e.g., thinking one can fly and jumping out a window) (Ungerleider & Pechnick, 1999). Traumatic and stressful external events can precipitate an adverse reaction (i.e., being arrested in the middle of a pleasant experience may precipitate an anxiety reaction) (Ungerleider & Pechnick, 1999). Despite these effects, there is not enough evidence to suggest that hallucinogen use itself, triggers violent behavior. However, the effects caused by hallucinogens may in fact, aggravate the effects of preexisting psychopathology, including violent outbursts (Reiss & Roth, 1993).

10. Conclusion

This review has focused on evolving research on substance abuse and violence. Although existent research has its limitations, such as small, nonrandom samples, retrospective data, the yield in review is impressive. Evidences from empirical studies support a strong association between alcohol and violent behavior. The use of alcohol and drugs are consistently mentioned as occurring prior or during the commission of many violent events, leading to a temporal association between the two. In the specific case of stimulants, its psychopharmacodynamic properties, such as those of amphetamines and cocaine, suggest that these substances play a contributing role in violent behavior. Most real-world studies indicate that the relationship between substance abuse and violence is exceedingly complex and moderated by a host of factors in the individual and the environment. Clearly, there is a subset of substance users who exhibit violent behavior. For some, the predisposition to aggressiveness may start in childhood

in troubled circumstances, before or during the onset of substance use. More research is needed to examine the genetic, neurobiologic, and psychosocial vulnerabilities of the subset of substance abusers who are at risk for violent perpetration, or victimization.

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